ZB-2550/ZB-2551 Series

User Manual

Warranty

All products manufactured by ICP DAS are under warranty regarding defective materials for a period of one year, beginning from the date of delivery to the original purchaser.

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1.Introduction

The ZB-2550/ZB-2550P/ZB-2550-T/ZB-2550-PA is hereinafter referred to as "ZB-2550 series" and the ZB-2551/ZB-2551P/ZB-2551-T/ZB-2551-PA is hereinafter referred to as "ZB-2551 series".

ZigBee is a specification based on the IEEE 802.15.4 standard for wireless personal area networks (WPANs). ZigBee operates in the ISM radio bands and its focus is to define a general-purpose, inexpensive, self-organizing, mesh network that can be used for industrial control, embedded sensing, medical data collection, smoke and intruder warning, building automation, home automation, and domotics, etc.

At present, the ICP DAS ZigBee converter ZB-2550 series and ZB-2550 series, supports the RS-232 and RS-485 interfaces. The main design goal is limited data communication using wireless transmission, so may provide a better solution for environments where wiring is difficult.

1.1 More Information

The ZB-2550 series and the ZB-2551 series are small-sized wireless ZigBee converters based on the IEEE 802.15.4 standard. They allow RS-485/RS-232 interfaces to be converted to a ZigBee wireless network. Only one ZB-2550 series (Host) is allowed in a ZigBee network and is used to initialize and manage the data transmission routes. The ZB-2551 series (Slave) ZigBee router is responsible for transmitting/receiving data from its child/parent router or the host. ICP DAS ZigBee products are designed for low data rates. The main benefit of ICP DAS ZigBee products is that they can be used to define a general-purpose, self-organizing mesh network, which can be highly advantageous for industrial control.

The typical transmission range of the ICP DAS Zigbee normal version and T-version series converter is 100m, and the P-version and PA-version is 700m.

The transmission frequency range of the ZigBee converter is between 2.405 GHz and 2.48 GHz, separated into 5 MHz sectors,

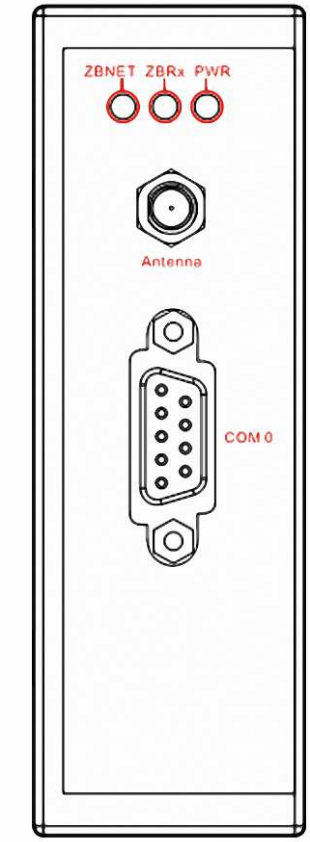
and provides 16 channels, and 65536 PAN IDs (65535 network groups can be set).

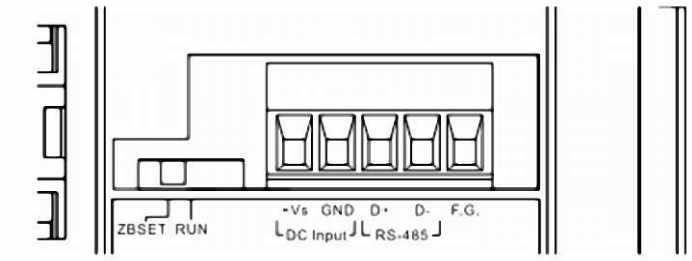
The ZigBee converter includes a repeater module that can be used to increase communication range or prevent data loss if the connection is interrupted or becomes unstable. Please refer to ZigBee converter other document for more information as following links:

http://ftp.icpdas.com/pub/cd/usbcd/napdos/zigbee/zigbee_converter/

1.2 Pin Assignment

ZB-2550/ZB-2551 Series





1.3 Specifications

Models	ZB-2550/ ZB-2551	ZB-2550P/ ZB-2551P	ZB-2550-T/ ZB-2551-T	ZB-2550-PA/ ZB-2551-PA
Wireless				
RF channels	16			
Receive sensitivity	-102 dBm			
Transmit power	9 dBm	22 dBm	4 dBm	22 dBm
Network Topology support	Star, Mesh and Cluster tree			
Antenna	2.4GHz - 3dBi Omni-Directional antenna			
Transmission Range	100 m	700 m	100 m	700 m

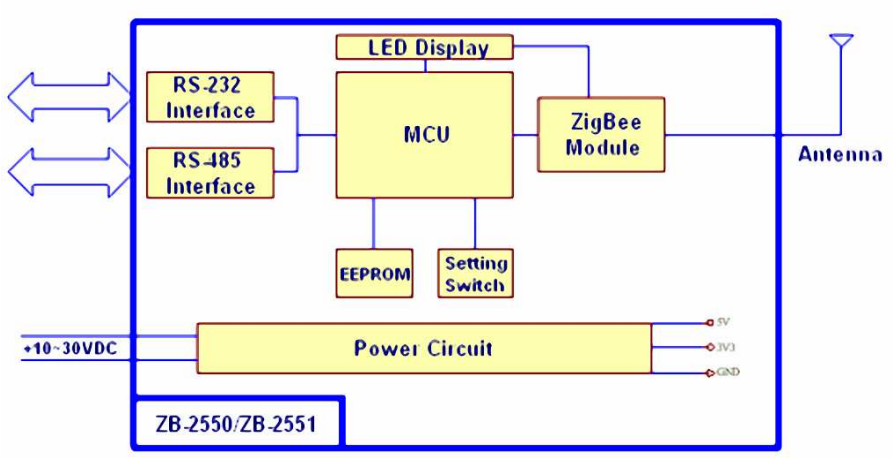
Notes: ZB-255x series, when the x equal 0 means host and 1 is slave.

Models	ZB-2550/ ZB-2551	ZB-2550P/ ZB-2551P	ZB-2550-T/ ZB-2551-T	ZB-2550-PA/ ZB-2551-PA
General				
CPU	8-bit microcontroller			
Module Type	Host/Slave	Host/Slave	Host/Slave	Host/Slave
Communication Interface				
COM 0	Host	RS-232 (TxD, RxD and GND); D-SUB 9 Female, Non-isolated		
	Slave	RS-232 (TxD, RxD and GND); D-SUB 9 Male, Non-isolated		
	RS-485 (DATA+, DATA-; internal ASIC self-tuner); Non-isolated			
COM 0 Settings				
Data Bit	8			
Parity	Even, Odd, None			
Stop Bit	1, 2			
LED Indicators				
ZigBee Net State	Green			
ZigBee RxD	Yellow			
Power	Red			
Power				
Protection	Power reverse polarity protection			
EMS Protection	ESD, Surge, EFT			
Required Supply Voltage	+10 V_{DC} ~ +30 V_{DC}			
Power Consumption	0.5 W	2 W (max)	0.5 W	2 W (max)
Connection	5-Pin 5.08 mm Removable Terminal Block			

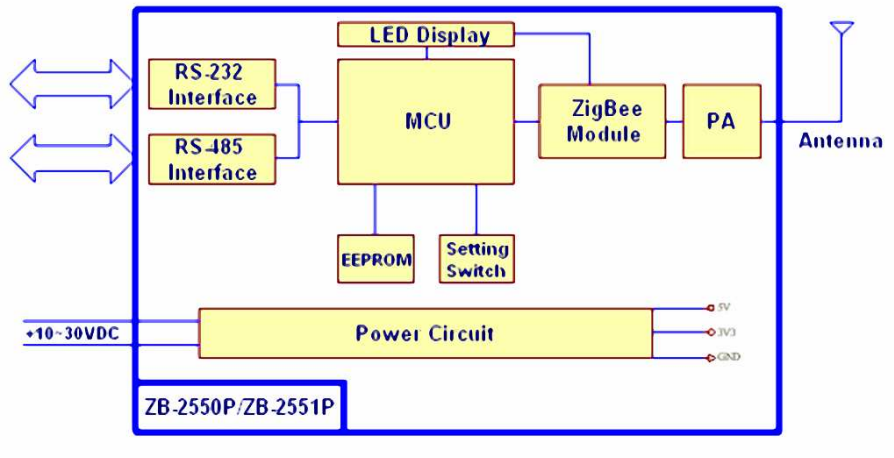
Models	ZB-2550/ ZB-2551	ZB-2550P/ ZB-2551P	ZB-2550-T/ ZB-2551-T	ZB-2550-PA/ ZB-2551-PA
Mechanical				
Casing	Plastic			
Flammability	UL 94V-0 materials			
Dimensions	33 mm x 78 mm x 107 mm (W x L x H)			
Installation	DIN-Rail			
Wireless				
Operating Temperature	-25 °C ~ +75 °C			
Storage Temperature	-40 °C ~ +80 °C			
Relative Humidity	5 ~ 95% RH, non-condensing			

1.4 Block Diagram

The Normal and T-version of ZB-2550/ZB-2551 Series:



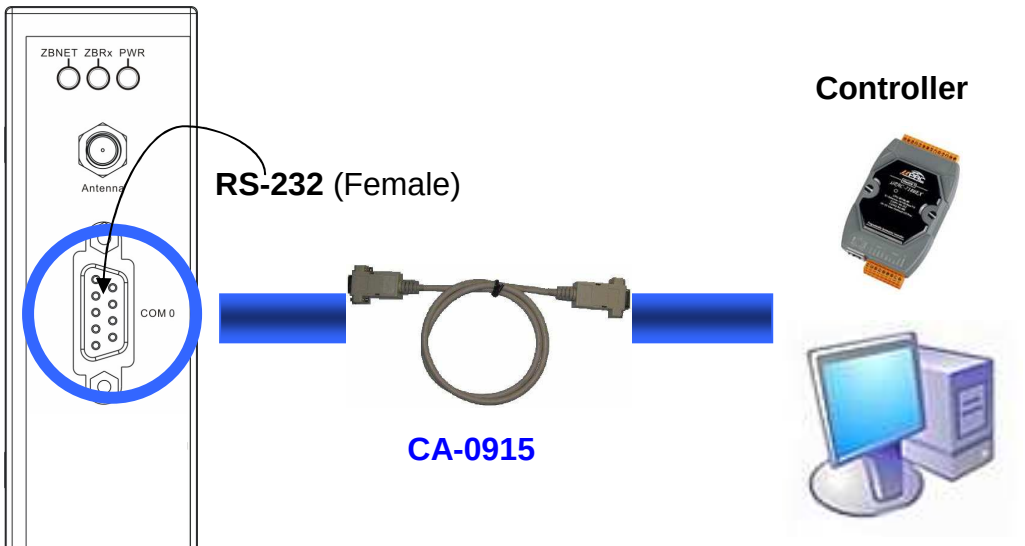
The P-version and PA-version of ZB-2550/ZB-2551 series.



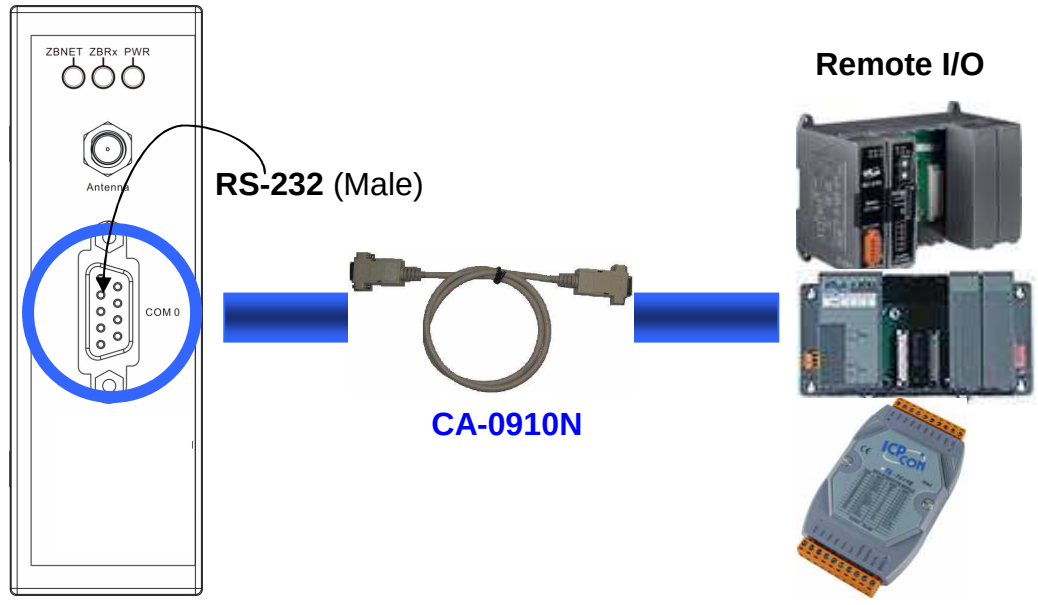
1.5 Wire Connection

Serial Port - RS-232

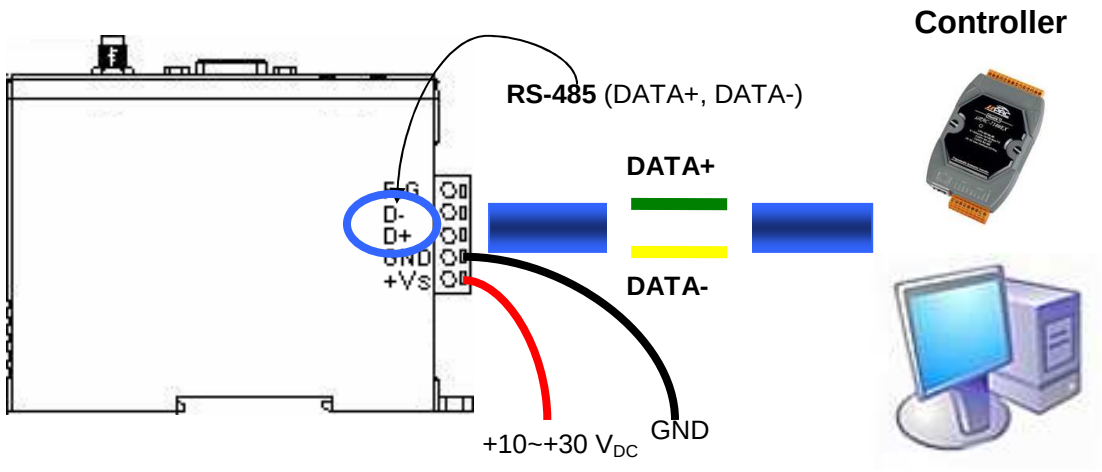
ZB-2550 Series



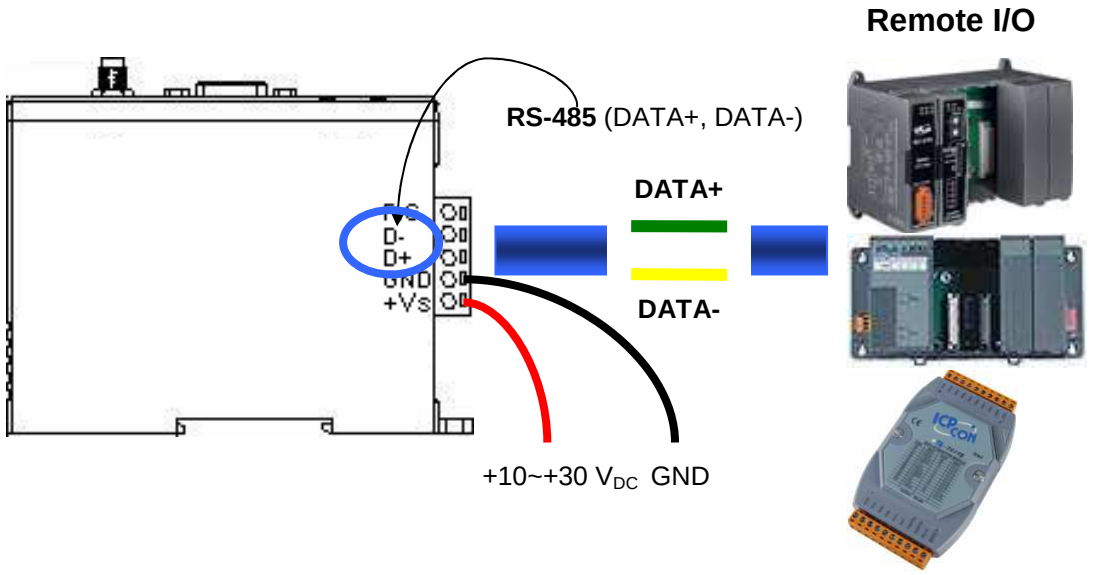
ZB-2551 Series



ZB-2550 Series

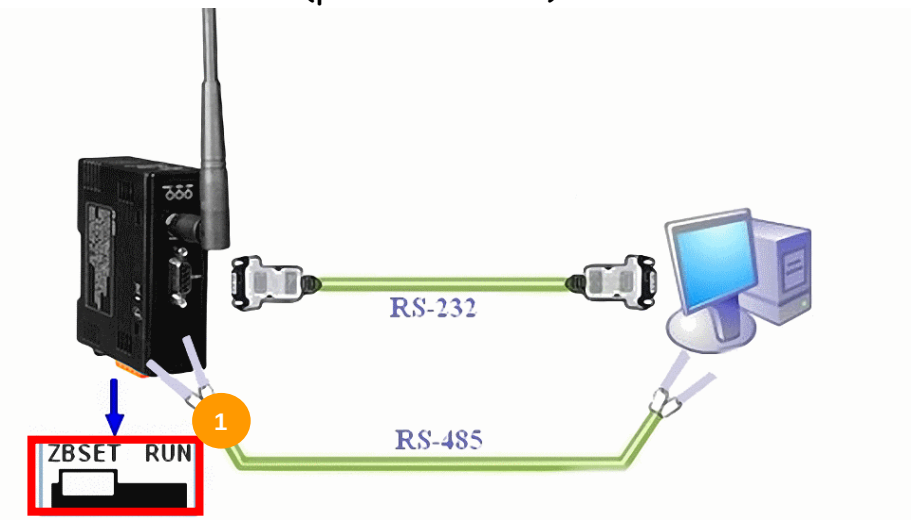


ZB-2551 Series



1.6 Quick Start

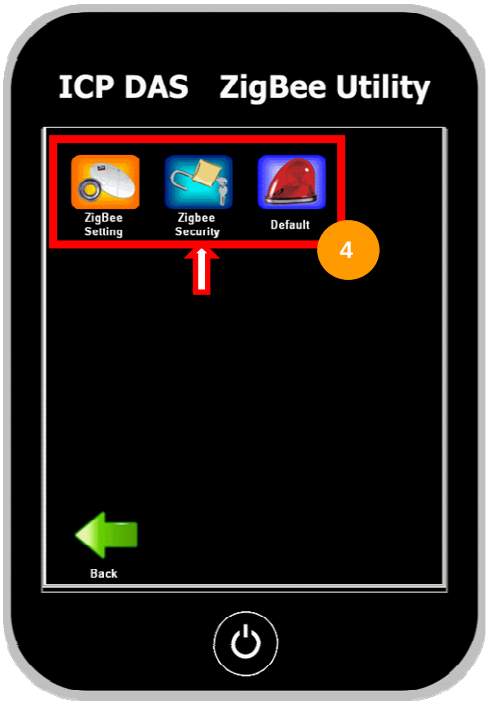
1. Before configuring the ZigBee converter, adjust the switch to the ZBSET position then re-boot (power off/on) the module. After configuration is complete, adjust the switch to the RUN position then re-boot (power off/on) the module.



2. When the following screen is displayed, click on the Module button. Please scroll the bar to switch the COM port number.

3. Click the ZB-255x series buttons to read the configuration.

4. Please select the Configuration item on the utility.



5. When the new configuration has selected, please click on the Configure button for set the new ZigBee setting.

6. After ZigBee module configuration has been successfully established. Now, adjust the switch to the RUN position then re-boot (power off/on) the module. Leverage the power of your data. Make it work for you.

Zigbee Addressing and Identifiers

- **Node ID** (0x0000~0xFFFF)

  A 16-bit address that describes a Zigbee node
  Randomly assigned during network join
  ZB-2570/ZB-2550 series always uses 0x0000
  ZB-2571/ZB-2551 series ranges 0x0001~0xFFFF
  ZB-DIO/ZB-AIO ranges 0x0001~0x001F
  Resolve by stack in case of collision
  Included in all message to identify node

- **PAN ID** (0x0000~0xFFFF)

  A 16-bit ID to identify the network
  Included in every packet
  A "logical" way to separate Zigbee networks running on same RF channel
  Defined during network formation by ZB-2570/ZB-2550 series
  ZB-DIOs/ZB-AIOs always uses 0xFF00 or 0xFF01

- **RF Channel**

  1 of 16 RF channels. Defined during network formation by ZB-2570/ZB-2550 series

  Note : A Work Zigbee Network - Running on the same PAN ID and RF Channel

- **Network Survival Detecting Time**

  ZB-2551 series will connect with Parent (ZB-2550 series) periodically to confirm the survival of network. If it detects unsuccessfully, and it process initialize network again to find a new parent.

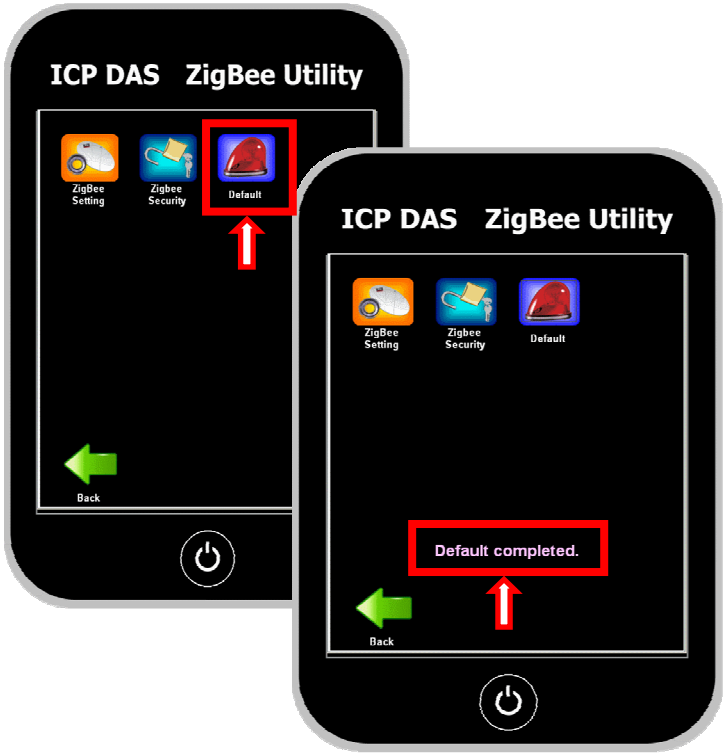
1.7 Default Settings

Default settings for the ZB-2550 series are as follows :

ZB Node ID :	0x0000
ZB PAN ID :	0xFF00
ZB Channel (RF Channel) :	0x00
ZBSET Data Format :	115200,n,8,1
Operating Mode :	Transparent

Default settings for the ZB-2551 series are as follows :

ZB Node ID :	0x0020
ZB PAN ID :	0xFF00
ZB Channel (RF Channel) :	0x00
ZBSET Data Format :	115200,n,8,1
Operating Mode :	Transparent
Network Survival Detecting Time :	20 seconds (0x14)



2. Applications

2.1 Operating Modes

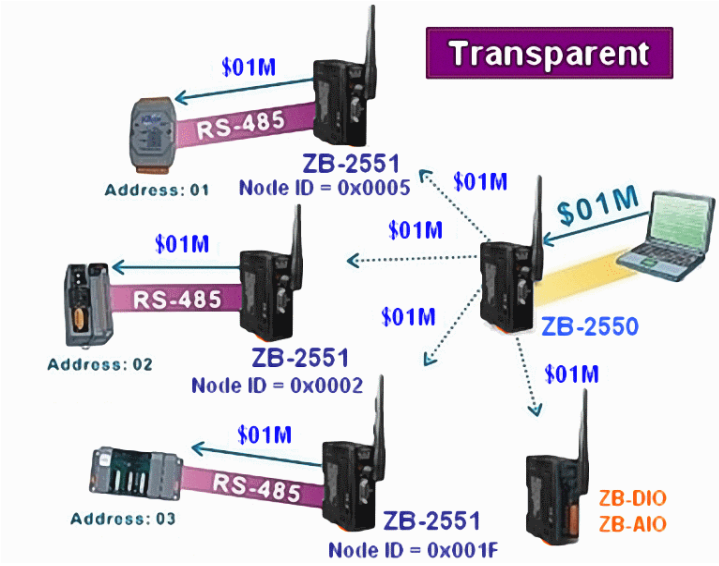
Interface	Operating Modes	
Serial Port (RS-232/RS-485)	Operating Mode 1	**Transparent**
	Operating Mode 2	**Modbus**
	Operating Mode 3	**Addressable**
	Operating Mode 4	**ZBIO(DCON,Modbus data)**

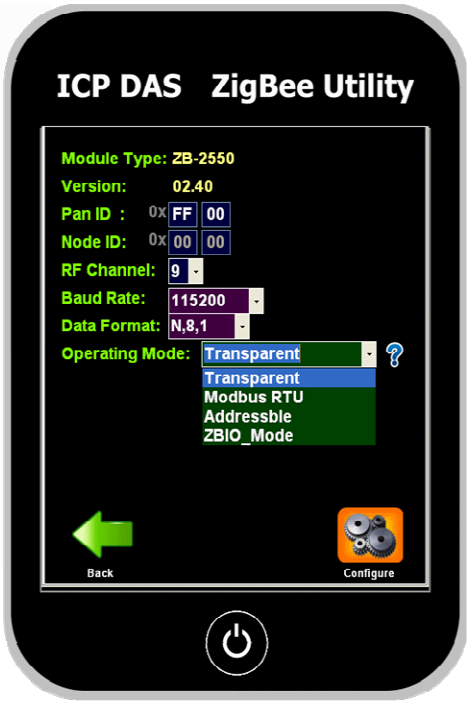
Operating Mode

- **Transparent Mode**

  (Original data will be broken down into many small data, each small data is 50 Byte)

  Transparent mode lets you use the ZB-2550/ZB-2551 series module like a router. (Maximum original data size is 200 bytes. Original data must not more than 200 bytes, e.g. "$01M" = 4 Bytes)

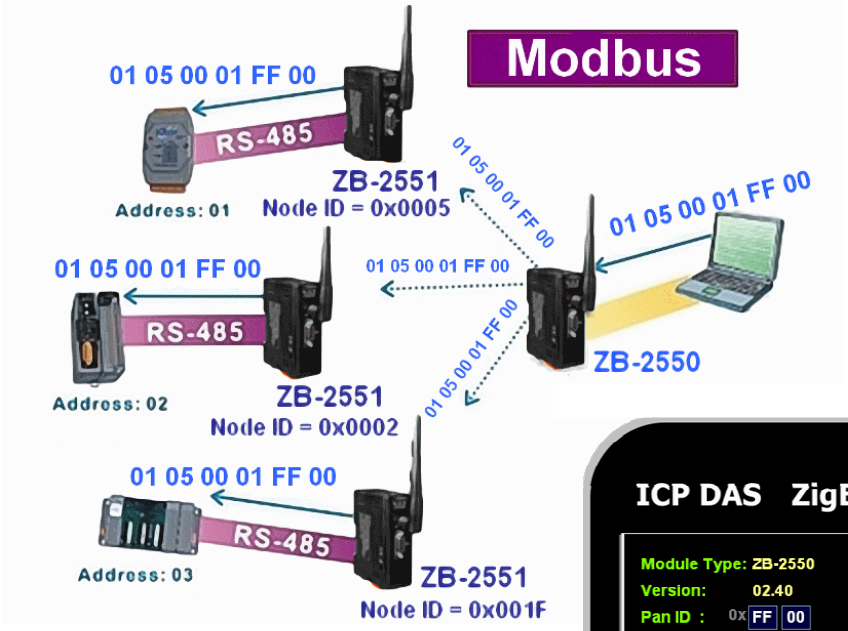


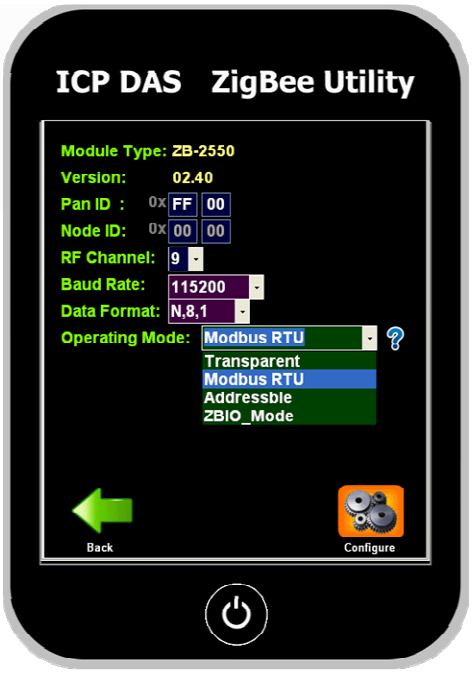


- **Modbus Mode**

  (Original data won't be broken down into small data)

  It is like Transparent mode. If original data size is greater than 50 bytes most of the time, Operating Mode Modbus is the most suitable. (Maximum original data size is 200 byte. Original data must not more than 200 bytes, e.g. "$01M" = 4 Bytes)





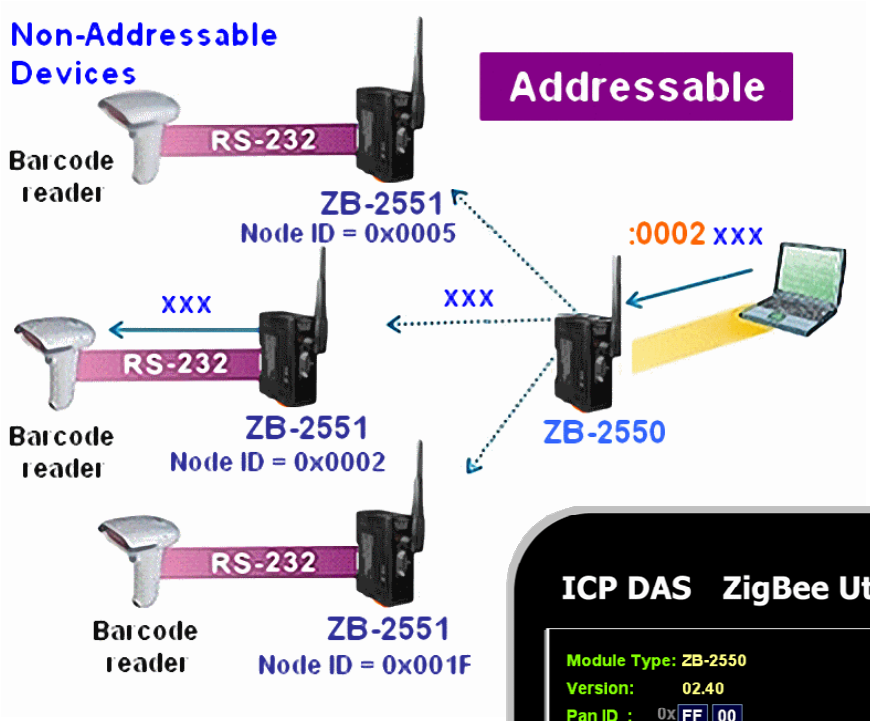
- **Addressable Mode**

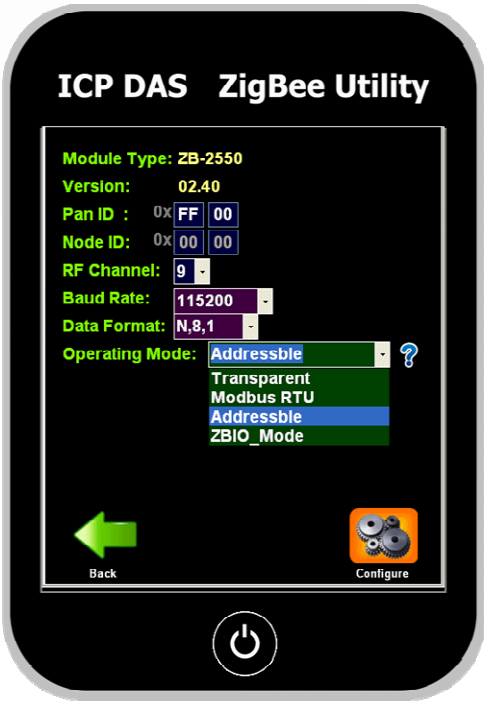
  (Original data won't be broken down into small data)

  For Non-Addressable Device, such as barcode reader.

  Syntax, **:ADDRxxx** , the **ADDR** is your ZB-2551 series Node ID.

  (Maximum original data size is 200 byte. Original data must not more than 200 byte, e.g. "xxx" = 3 Byte)

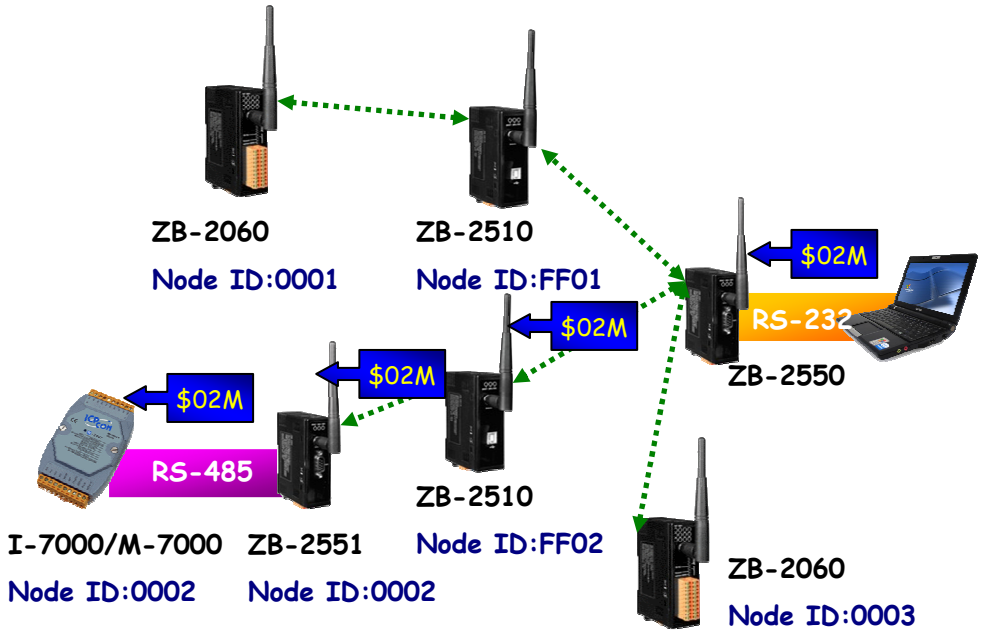




- **ZBIO Mode (For DCON or Modbus data in multi-layers)**

  (Original data will be broken down into small data)

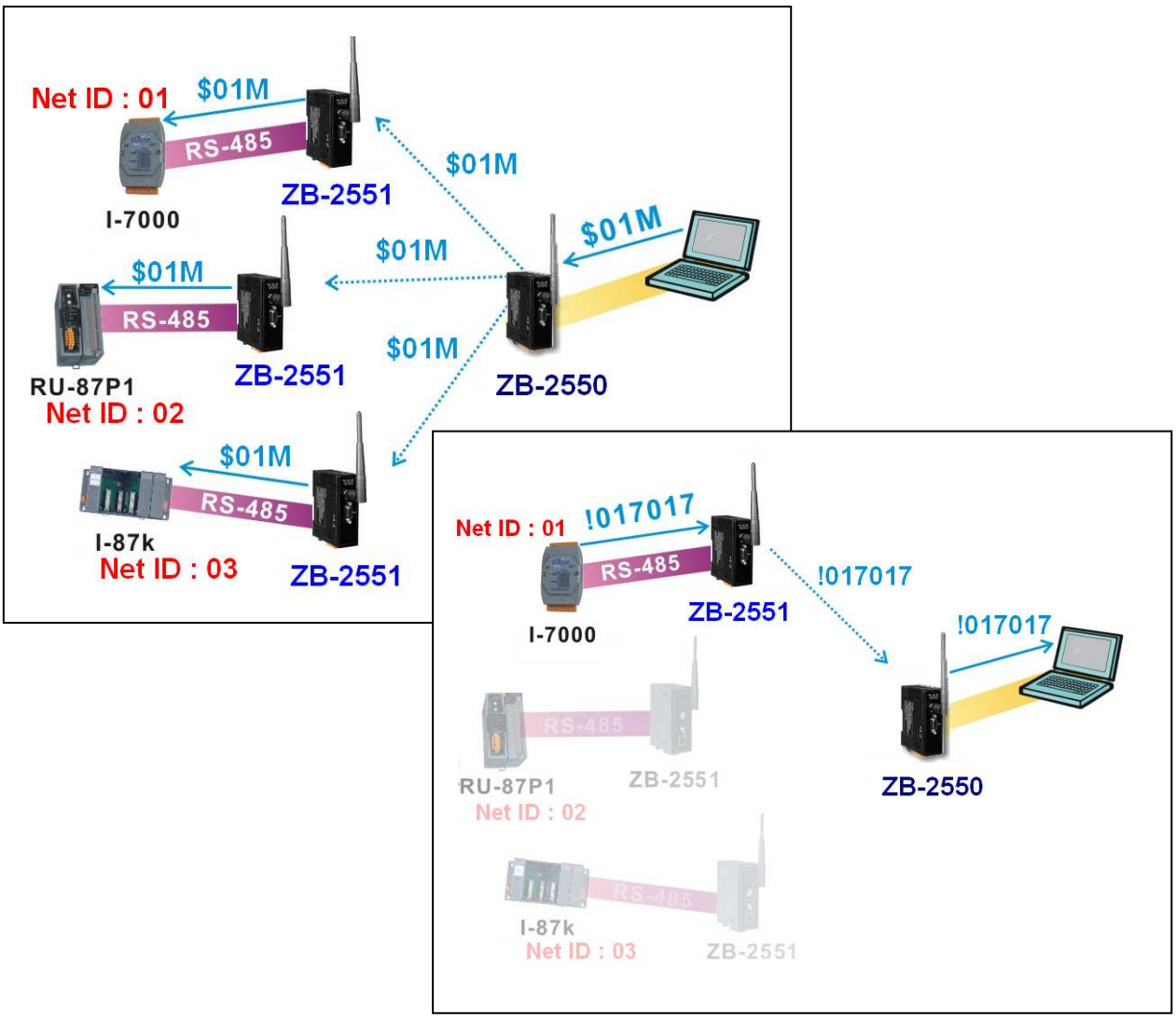
  For DCON or Modbus RTU devices, such as ZB-DIO, ZB-AIO, ZB-Slave with 7000 modules. When the Zigbee network is multi-layers framework, the operating Mode ZBIO is the most suitable. (Maximum original data size is 200 byte. Original data must not more than 200 byte, e.g. "$01M" = 4 Byte)



2.2 Application Example

Operating Mode 1 : Transparent Mode

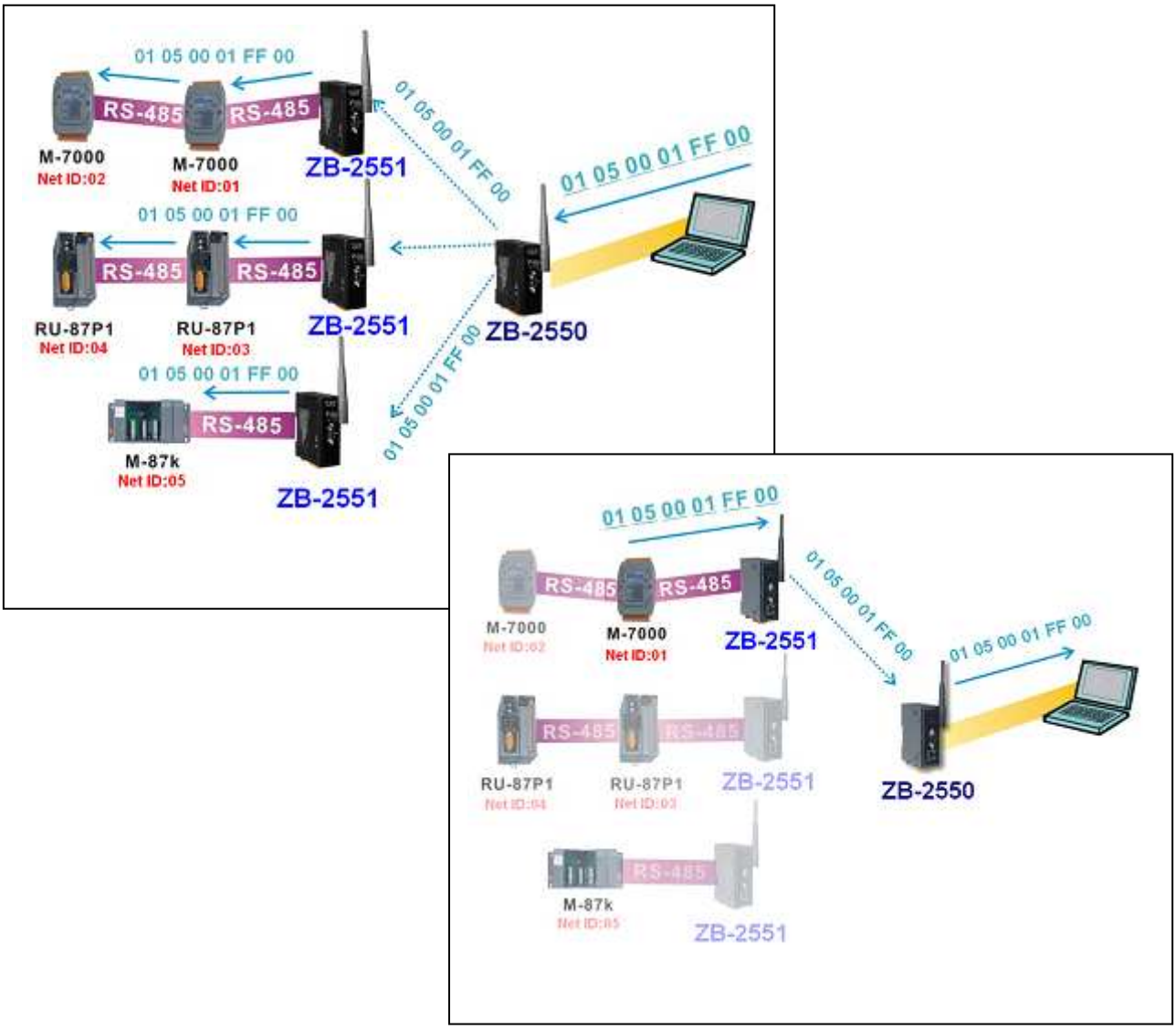
If you want the addressable RS-232/RS-485 interface device convert to ZigBee Wireless Networks, such as the ICPDAS I-7000/M-7000/I-87k remote I/O modules, you can use the ZB-2551 series (slave) to connect to these I/O modules and use the ZB-2550 series (host) to connect to your controller or PC. If original data size is **less than 50 Byte most of the time**, this Mode is the most suitable.



In some applications where the host controller needs to broadcast data to all RS-232/RS-485 devices and these devices receive data only (no response), you can also use this mode.

Operating Mode 2 : Modbus Mode

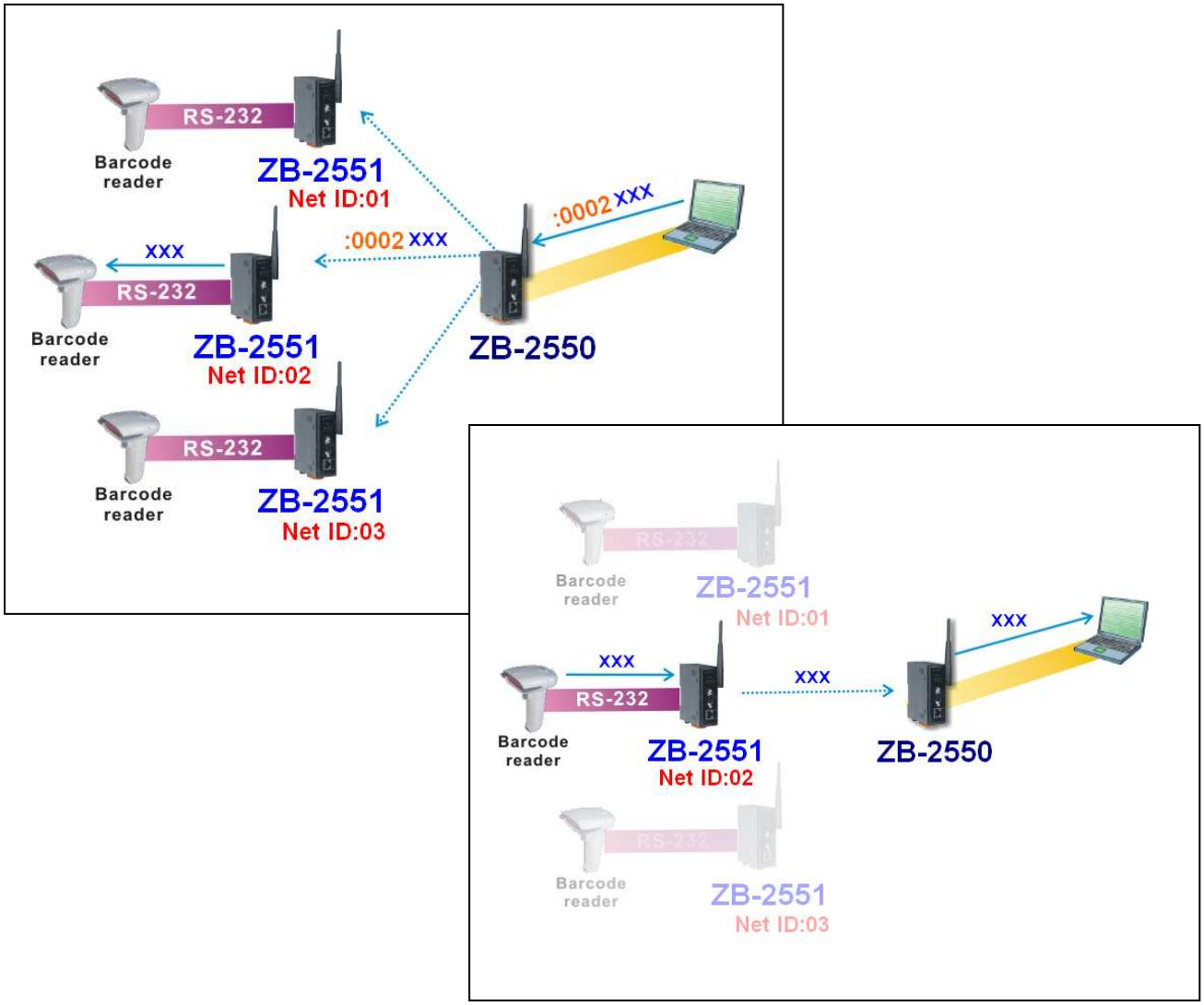
If you want the addressable RS-232/RS-485 interface device convert to ZigBee Wireless Networks, such as the ICPDAS I-7000/M-7000/I-87k remote I/O modules, you can use the ZB-2551 series (slave) to connect to these I/O modules and use the ZB-2550 series (host) to connect to your controller or PC. If original data size is **greater than 50 byte most of the time**, this Mode is the most suitable.



In some applications where the host controller needs to broadcast data to all RS-232/RS-485 devices and these devices receive data only (no response), you can also use this mode.

Operating Mode 3 : Addressable Mode

If the RS-232/RS-485 interface modules aren't addressable or the network in the multi-layers framework. Add 5 ASCII characters to the header of the original request data from your controller, then the remote device with the correct address will respond to it. This mode is similar to that used in ICPDAS I-752N products.



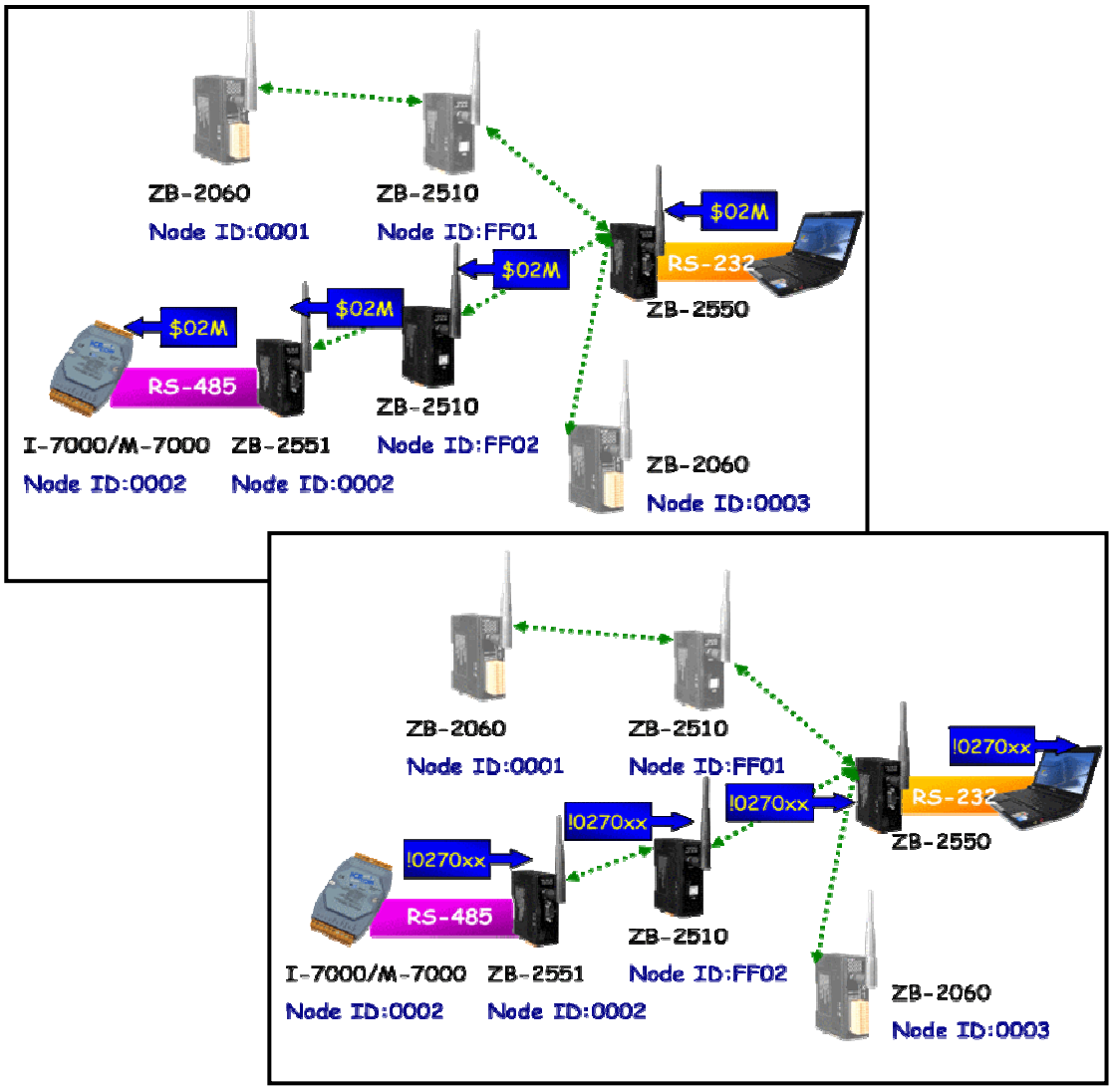
Syntax:

:ADDRxxx

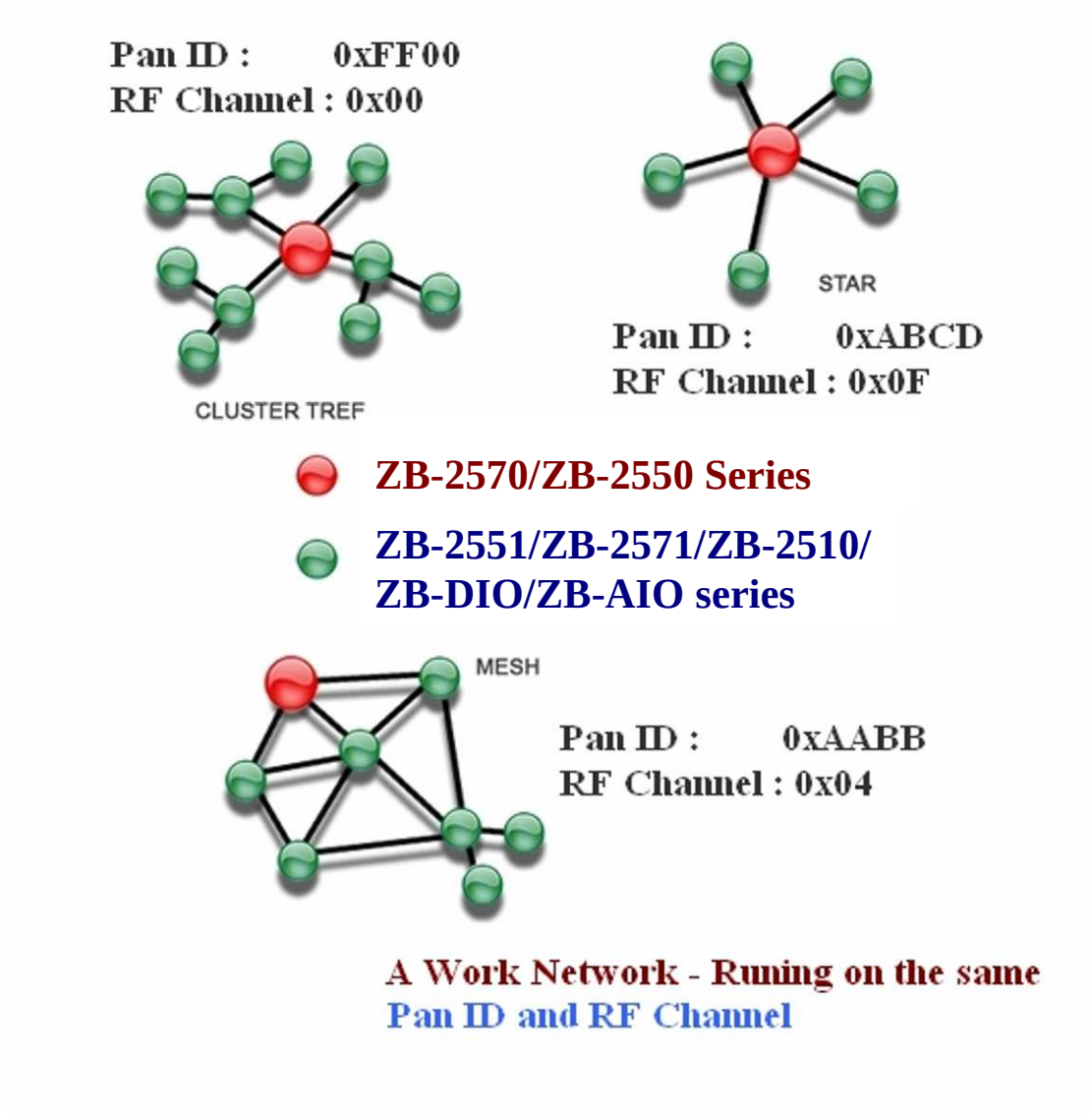
:	Delimiter character
ADDR	The ADDR is your ZB-2551(P) Node ID
xxx	xxx is your original data

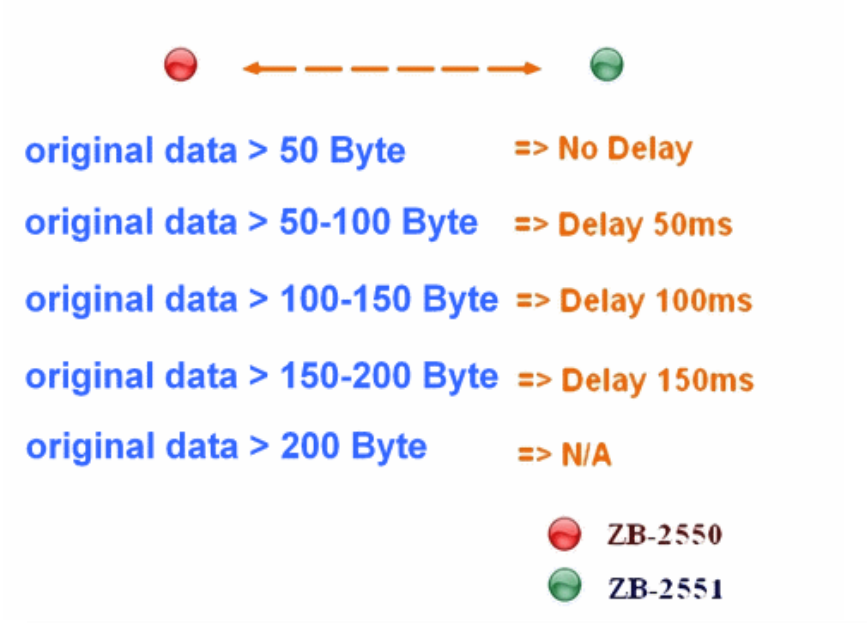
Operating Mode 4 : ZBIO Mode

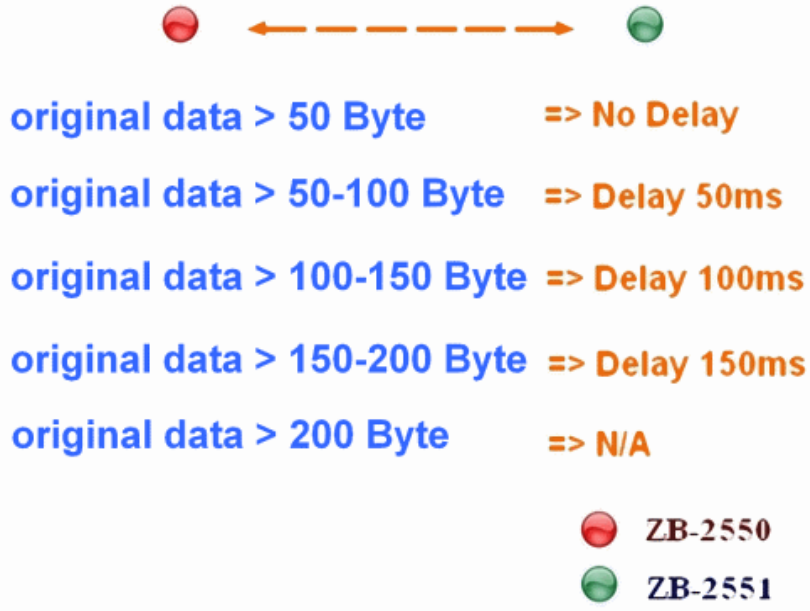
If the zigbee network is multi-layers and the transmission using DCON or Modbus protocol. The mode will catch the address like addressble mode to be index to send the correct device. The other device won't receive unless message.



2.3 ZigBee Network Groups




original data > 50 Byte => No Delay
original data > 50-100 Byte => Delay 50ms
original data > 100-150 Byte => Delay 100ms
original data > 150-200 Byte => Delay 150ms
original data > 200 Byte => N/A
ZB-2550
ZB-2551


original data > 50 Byte => No Delay
original data > 50-100 Byte => Delay 50ms
original data > 100-150 Byte => Delay 100ms
original data > 150-200 Byte => Delay 150ms
original data > 200 Byte => N/A
ZB-2550
ZB-2551

If original data size is less than 50 Byte most of the time, Operating Mode Transparent is the most suitable.

If original data size is greater than 50 Byte most of the time, Operating Mode Modbus is the most suitable.

If you want to transmit more than 200 Byte one data or high-speed rate, please order an advanced ZigBee Converter ZB-2570 and ZB-2571.

3. Appendix

3.1 Zigbee Version Comparison

	Normal-version	T-version	P-version	PA-version
Transmission power	9 dBm	3.7 dBm	24 dBm	24 dBm
Antenna 2.4 GHz –	3 dBi Omni-Directional antenna	3 dBi Omni-Directional antenna	5 dBi Omni-Directional antenna	5 dBi Omni-Directional antenna
Transmission range (LOS)	100 m	100 m	700 m(Typical) 1 km(Max.)	700 m(Typical) 1 km(Max.)
ZB-100R/ZB-100T Supported	No	Yes	No	Yes
Supports Max. Slaves (Host)	60	256	60	256
Certification	No	CE/FCC,FCC ID	No	No

- **Technical Support**

  If you have problems about using the ZB-2000 series modules, please contact ICP DAS Product Support.

  Email: Service@icpdas.com